STATEMENT OF ANTHONY J. BRODERICK, ASSOCIATE ADMINISTRATOR FOR REGULATION AND CERTIFICATION, FEDERAL AVIATION ADMINISTRATION, BEFORE THE HOUSE COMMITTEE ON PUBLIC WORKS AND TRANSPORTATION, SUBCOMMITTEE ON AVIATION, CONCERNING THE TRAFFIC ALERT AND COLLISION AVOIDANCE SYSTEM. MAY 4, 1989.

Mr. Chairman and Members of the Subcommittee:

I am pleased to appear before you today to discuss our efforts to comply with the statutory requirements for the implementation of the Traffic Alert and Collision Avoidance System (TCAS). We appreciate the support and guidance which this Subcommittee has given to our efforts to develop TCAS and look forward to your continued support to reach our shared goal of minimizing the possibility of midair collisions.

Nearly eight years ago, the FAA decided to proceed with the implementation of TCAS. Since that time, the FAA and the aviation industry have made great strides in overcoming this most complex and difficult technological challenge. I would like to briefly review for you our approach to TCAS.

We have attempted to develop a family of collision avoidance systems, demonstrate the operational and technical feasibility of the concept, and support the development of national and international standards for the equipment.

As you know, there are three versions of TCAS: TCAS I, TCAS II, and TCAS III. The least expensive system, TCAS I, is designed for use on smaller turbine-powered aircraft with seating capacity of

30 seats or less. TCAS I will only generate traffic advisories. Traffic advisories indicate the presence of other aircraft. Because of its estimated cost of approximately $10,000, it should be affordable for installation on some general aviation aircraft.

TCAS II will generate traffic and resolution advisories. Resolution advisories tell the pilot what maneuver to execute to avoid another aircraft. In the case of TCAS II, only "up or down" advisory maneuvers are provided. TCAS II is intended for installation in medium and large transport category type aircraft.

TCAS III is also intended for installation in transport category aircraft. This advanced system, when fully developed and certified, will generate traffic and resolution advisories in both the horizontal (right or left) and vertical (up or down) planes. Our work with TCAS III is structured into two distinct program stages. The first is a formal development and validation phase during which the required technical characteristics will be determined, the technical issues identified, and the technical performance verified. Once basic system performance has been demonstrated, a limited installation program will be implemented. TCAS III is still in the first phase of development and is undergoing further testing. It will not be ready for FAA certification for some time.

The Airway Safety and Capacity Expansion Act of 1987, enacted on December 30, 1987 as Public Law 100-223, required that all air carriers be equipped with TCAS II by December 30, 1991. I would now like to provide an overview of our initiatives to comply with the statutory mandate.

An operational evaluation of a TCAS II prototype system was conducted last year on a Piedmont Airlines B-727. This operational evaluation was designed to provide initial crew reaction to TCAS II generated traffic and resolution advisories. We believe the evaluation was successful and demonstrated that flightcrews are able to use the system properly without being distracted.

Utilizing cost-sharing contracts, the FAA provided seed money to Allied Bendix Corporation teamed with United Airlines, and to Honeywell Corporation teamed with Northwest Airlines for limited installation programs (LIP). A total of 14 preproduction units were fabricated for demonstration during the LIP evaluations. The LIP programs began in January 1988, with units installed on United Airlines B-737 and DC-8 aircraft. Northwest Airlines is currently flying two MD-80's with TCAS II units. Results of the LIP flights to date indicate that TCAS II provides a significant degree of protection against potential midair collisions, has little or no impact on the air traffic control system, and has little or no

impact on pilot workload. With the LIP well underway, and manufacturers initiating production units for both national and international airlines, the development of TCAS II is completed. In fact, TCAS units will be included in the new aircraft being ordered by air carriers to replace their aging fleet.

In February of this year, our Final Rule requiring TCAS installation no later than December 30, 1991 became effective. Our Final Rule is responsive to the requirements of Public Law 100-223. In October 1988, the FAA published Technical Standard Order (TSO) No. C-119, "TCAS-II Airborne Equipment." This TSO provides the performance standard that TCAS devices must meet in order to be acceptable to the FAA. In addition, Advisory Circular (AC) 20-131, "Airworthiness and Operational Approval of Traffic Alert and Collision Avoidance System (TCAS II) and Mode S Transponders," was published. This AC provides guidance material for those interested in obtaining airworthiness and operational approval of TCAS. In conjunction with our regulatory requirement, these materials provide all the necessary documentation to support certification of TCAS II.

The FAA has also established a training workshop for its engineers and flight test pilots who will be involved in TCAS certification,in order that we can consistently interpret certification criteria resulting from questions which inevitably

arise from such technical projects. We anticipate making this training available to the private sector to assist in its implementation of TCAS systems.

To facilitate the smooth certification and installation of TCAS II, we have established a TCAS certification project office. In addition to being responsive to questions and problems from local aircraft certification offices (ACO), the certification project office is also the focal point for a special certification team, which will be available to the ACO's for technical guidance and assistance. We are currently in the process of establishing a transition team to help provide for an orderly transition from initial installation to complete airline TCAS II-equipage. The team will support the airlines and avionics industry during initial implementation and will assess TCAS system operability in the National Airspace System.

We have also conducted a number of workshops in the United States and one in Europe to provide detailed information to airworthiness officials and industry representatives. Another European workshop is scheduled for this summer. We are also attempting to schedule a workshop for South American carriers and civil aviation authorities. These workshops were designed to make clear that all affected parties understand the TCAS requirements and the projected compliance schedule. These workshops are important in

that they assist all affected parties in developing acceptable airworthiness compliance standards. As recently as last week, we met with the Air Transport Association to discuss details of TCAS implementation and a monitoring program to assure a smooth introduction of TCAS into the National Airspace System.

Subsequent to the passage of Public Law 100-223, the Senate Subcommittee on Aviation asked the Office of Technology Assessment (OTA) to assess the safety implications of the TCAS II certification and implementation schedule. The OTA study, completed in February, reviewed a number of safety, technical, economic, and international issues, which were not readily apparent at the time of the law's enactment. The study concluded in part:

> "Although OTA finds no reason to delay <u>initial</u> TCAS II implementation, sufficient airline resource limitations, economic inequities, and international implications stem from the present deadline for Congress to consider extending the installation schedule. If an extension is enacted, specific requirements in the same law will be needed to ensure that installation of TCAS II begins promptly after production equipment is available and proceeds at a reasonable pace over the span of any extension. Prompt congressional consideration of any change to Public Law 100-223 is also important. Indeed,

the forcing effect of legislation is likely to be necessary to ensure maximum safety benefits as early as possible and to allow airlines to make appropriate plans for investments in personnel and equipment."

The OTA further noted that requiring and linking an operational evaluation program, a phased compliance schedule, and an extended deadline would place additional responsibilities on each affected party and spread economic burdens more equitably, while providing maximum safety benefits.

Members of Congress and others have written the FAA to determine our views on a TCAS phase-in period. We agree with the establishment of a phase-in of TCAS. During a phase-in period safe system design can be verified, operational reliability can be demonstrated in actual service, and any unexpected air traffic control system interactions can be analyzed. Our experience with the ground proximity warning system and the emergency locator transmitter showed that undue haste in requiring the installation of new systems led to a great deal of confusion, frustration, and unnecessary cost. As I indicated earlier in my testimony, TCAS is one of the most tested pieces of avionics ever developed. Over 2,000 hours of actual flying were done with the Piedmont and United Airlines, and the Northwest effort is virtually completed.

TCAS is a well-proven system in which we have great confidence. Nevertheless, it is a virtual certainty that small unforeseen difficulties will arise when large numbers of aircraft are equipped with and using TCAS. Were it not for the tight statutory TCAS installation deadline, we would propose to provide for such a phase-in period by regulation.

As you know, Mr. Chairman, we have another regulatory initiative requiring the installation of windshear alert and flightpath guidance equipment. We believe that it would be more efficient and substantially less costly if there were congruence between the installation timetables for TCAS II and the windshear alert and flightpath guidance equipment. Our original proposal for installation of windshear equipment was two years. However, following that proposal, Congress enacted Public Law 100-223, which set a firm December 30, 1991, deadline for TCAS installation. We concluded that it would not be possible to meet both the two-year windshear equipment installation schedule and the statutory mandate for the installation of TCAS. In view of the conflict and recognizing our inability to extend the TCAS installation date through rulemaking, we amended our windshear rule installation period for those air carriers which can demonstrate a need for an extension.

Today, with the benefit of more knowledge and experience in both

the TCAS and windshear equipment installation, it is clear that even the existing windshear equipment installation schedule deadline is going to be difficult to achieve by some air carriers, though we continue to believe that schedule can be met. There is no doubt, however, that it would be far more efficient to have the two installations schedules identical so that significant aircraft alterations can be dealt with at one time.

These are extremely complex avionics retrofit installations which are on a very tight timetable. Their complexity means that literal disassembly, modification, and reassembly of major portions of the cockpit and electronics bays will have to be undertaken for all aircraft. The lack of commonality of the schedules means that, practically speaking, in order to meet the tightest TCAS schedule, no advantage can be taken of the opportunity to install windshear equipment when TCAS is being installed. To do so would slow down TCAS installation and endanger compliance with the statutory deadline. We believe it would be preferable to have one cycle of disassembly and reassembly during which both systems are installed. Any decisions requiring an adjustment in the TCAS schedule should be made as soon as possible to avoid chaotic, uneven or potentially unfair effects on the various air carriers. The establishment of a phased compliance schedule, with identical milestones for each

program, would be desirable and, for this reason, we support the recently introduced proposal to make necessary schedule changes.

In closing, I would like to again stress that we appreciate the Subcommittee's interest in the development of TCAS to improve aviation safety. Mr. Chairman, that concludes my prepared statement and I would be pleased to answer any questions you or other Members of the Subcommittee may have.